

	ALL DATA	>2X AVERAGE BG
Exposure Rate (95% Student's-t UCL), µR/h	42.2	63.5
Exposure Rate (95% Student's-t UCL), mR/h	0.04215	0.06349

	ALL DATA	>2X AVERAGE BG			
Current exposed populations	Exposure time (h/d)	Exposure Frequency (d/y)	Ranking	Annual Dose (mrem/year)	Annual Dose (mrem/year)
resident adult	1	215	1	9	14
resident child	1	215	1	9	14

Assumptions:
Adult resident is conservatively outdoors in the vicinity of contamination 1 hour a day for 215 days/year. We are assuming the residents check for mail and wait with children for school bus/mows the lawn in this area.
Child resident is assumed to play and wait for the school bus in the vicinity of contamination.
Visitors and trespassers were considered but not quantified because their anticipated exposures would be so insignificant.

UCL Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation
From File
Full Precision
Confidence Coefficient
Number of Bootstrap Operations

4/14/15 11:51
Worksheet.xls
OFF
95%
2000

bkg	avg bkg
9.396	9.2885
9.181	
source gross	source net
26.136	16.8475
56.456	47.1675
101.73	92.4415
45.996	36.7075
42.454	33.1655
19.486	10.1975
18.144	8.8555
14.182	4.8935
14.052	4.7635
13.952	4.6635

UMR_alldata

General Statistics
Total Number of Observations

Minimum
Maximum
SD
Coefficient of Variation

Normal GOF Test
Shapiro Wilk Test Statistic
5% Shapiro Wilk Critical Value
Lilliefors Test Statistic
5% Lilliefors Critical Value
Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution
95% Normal UCL
95% Student's-t UCL

Gamma GOF Test
A-D Test Statistic
5% A-D Critical Value
K-S Test Statistic
5% K-S Critical Value
Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics
k hat (MLE)
Theta hat (MLE)
nu hat (MLE)
MLE Mean (bias corrected)

Adjusted Level of Significance

Assuming Gamma Distribution
95% Approximate Gamma UCL (use when n>=50)}

Lognormal GOF Test
Shapiro Wilk Test Statistic
5% Shapiro Wilk Critical Value
Lilliefors Test Statistic
5% Lilliefors Critical Value
Data appear Lognormal at 5% Significance Level

Lognormal Statistics
Minimum of Logged Data
Maximum of Logged Data

Assuming Lognormal Distribution
95% H-UCL
95% Chebyshev (MVUE) UCL
99% Chebyshev (MVUE) UCL

10Number of Distinct Observations
Number of Missing Observations
4.664Mean
92.44Median10
27.9Std. Error of Mean1
1.074Skewness35.26
22.81
8.824
1.704
0.795Shapiro Wilk GOF Test
0.842Data Not Normal at 5% Significance Level
0.228Lilliefors GOF Test
0.28Data appear Normal at 5% Significance Level
95% UCLs (Adjusted for Skewness)
42.1595% Adjusted-CLT UCL (Chen-1995)
95% Modified-t UCL (Johnson-1978)
54.85
52.23
0.449Anderson-Darling Gamma GOF Test
0.746Detected data appear Gamma Distributed at 5% Significance Leve
0.199Kolmogrov-Smirnoff Gamma GOF Test
0.273Detected data appear Gamma Distributed at 5% Significance Leve
1.124k star (bias corrected MLE)
23.11Theta star (bias corrected MLE)
22.48nu star (bias corrected)
25.97MLE Sd (bias corrected)1.674
Approximate Chi Square Value (0.05)
0.0267Adjusted Chi Square Value33.48
27.25
21.25
50.8395% Adjusted Gamma UCL (use when n<50)19.57
0.912Shapiro Wilk Lognormal GOF Test
0.842Data appear Lognormal at 5% Significance Level
0.16Lilliefors Lognormal GOF Test
0.28Data appear Lognormal at 5% Significance Level
1.54Mean of logged Data
4.527SD of logged Data
3.329
0.693
89.7290% Chebyshev (MVUE) UCL
65.8897.5% Chebyshev (MVUE) UCL
117.4
57.91

Nonparametric Distribution Free UCL Statistics			83.21
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	40.48	95% Jackknife UCL	
95% Standard Bootstrap UCL	39.83	95% Bootstrap-t UCL	
95% Hall's Bootstrap UCL	66.12	95% Percentile Bootstrap UCL	
95% BCA Bootstrap UCL	44.43		51.43
90% Chebyshev(Mean, Sd) UCL	52.44	95% Chebyshev(Mean, Sd) UCL	62.86
97.5% Chebyshev(Mean, Sd) UCL	81.08	99% Chebyshev(Mean, Sd) UCL	50.06
Suggested UCL to Use			
95% Student's-t UCL	42.15		73.72
			123.1

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. For additional insight the user may want to consult a statistician.

ProUCL Output - >2X AVERAGE BACKGROUND
UCL Statistics for Uncensored Full Data Sets

User Selected Options			
Date/Time of Computation	4/14/15 11:55		
From File	WorkSheet_a.xls		
Full Precision	OFF		
Confidence Coefficient	95%		
Number of Bootstrap Operations	2000		
>2x BG			
General Statistics			
Total Number of Observations	6	Number of Distinct Observations	6
		Number of Missing Observations	0
Minimum	10.2	Mean	48.71
Maximum	92.44	Median	44.23
SD	29.26	Std. Error of Mean	11.95
Coefficient of Variation	0.742	Skewness	1.35
Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.0			
Normal GOF Test			
Shapiro Wilk Test Statistic	0.889	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.788	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.229	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.362	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	63.49	95% Adjusted-CLT UCL (Chen-1995)	75.4
		95% Modified-t UCL (Johnson-1978)	73.88
Gamma GOF Test			
A-D Test Statistic	0.21	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.703	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.156	Kolmogrov-Smirnoff Gamma GOF Test	
5% K-S Critical Value	0.335	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.273	k star (bias corrected MLE)	1.956
Theta hat (MLE)	17.34	Theta star (bias corrected MLE)	24.9
nu hat (MLE)	27.28	nu star (bias corrected)	23.47
MLE Mean (bias corrected)	39.42	MLE Sd (bias corrected)	34.83
		Approximate Chi Square Value (0.05)	13.45
Adjusted Level of Significance	0.0122	Adjusted Chi Square Value	10.81
Assuming Gamma Distribution			

95% Approximate Gamma UCL (use when n>=50))	81.5	95% Adjusted Gamma UCL (use when n<50)	105.8
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.977	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.788	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.199	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.362	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.322	Mean of logged Data	3.744
Maximum of Logged Data	4.527	SD of logged Data	0.582
Assuming Lognormal Distribution			
95% H-UCL	137	90% Chebyshev (MVUE) UCL	83.07
95% Chebyshev (MVUE) UCL	94.12	97.5% Chebyshev (MVUE) UCL	120.4
99% Chebyshev (MVUE) UCL	163.9		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	59.07	95% Jackknife UCL	72.78
95% Standard Bootstrap UCL	57.48	95% Bootstrap-t UCL	86.8
95% Hall's Bootstrap UCL	163.1	95% Percentile Bootstrap UCL	68.06
95% BCA Bootstrap UCL	65.03		
90% Chebyshev(Mean, Sd) UCL	75.26	95% Chebyshev(Mean, Sd) UCL	100.8
97.5% Chebyshev(Mean, Sd) UCL	114	99% Chebyshev(Mean, Sd) UCL	167.6
Suggested UCL to Use			
95% Student's-t UCL	63.49		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. For additional insight the user may want to consult a statistician.

Site	Receptor	Annual Dose (mrem/year)		
Upper Mountain Road	resident adult	9		
	resident child	9		
Holy Trinity Cemetery	maintenance worker	32		
	dog walker	26		
Niagara Falls Boulevard	recreational - indoor bowling alley	4		
	facility workers - indoor bowling alley	45		
	facility workers - parking lots	18		
	maintenance workers - indoor bowling alley	9		
	facility workers - indoor former used car lot	55		
	trespassers - parking lots	1		
Canadian Radium and Uranium Corp.	site workers	Stockade-Fenced Area	Formerly Fenced Old Depot Area "Source 1"	Soil strip parallel to Hedgerow and concrete apron "Source 2"
		19	84	47

The dose assessment considered only current receptors. Hypothetical future receptors were not evaluated. The evaluated exposure pathway in this assessment is external exposure to gamma radiation from the slag. The dose equivalent of 12 mrem/yr is based on the previous exposure duration of 30 years. This has now been updated to 26 years in the EFH 2011. Each of the dose equivalents for the other exposed populations were adjusted based on the assumed ED (i.e., residential child = 6 yrs, recreational child = 10 yrs (age 8-18), commercial workers = 25 years).

e (mrem/year)			Cancer Risk Incidence				
9			1.E-05				
9			1.E-05				
32			4/E-05				
26			3.E-05				
4			5.E-06				
45			5.E-05				
18			2.E-05				
9			1.E-05				
55			6.E-05				
1			1.E-06				
	"Source 3"	Combined Hot Spots	Stockade-Fenced Area	Formerly Fenced Old Depot Area "Source 1"	Soil strip parallel to Hedgerow and concrete apron "Source 2"	"Source 3"	Combined Hot Spots
	15	64	2.E-05	1/E-06	5.E-05	2/E-05	7.E-05

are not evaluated. The evaluated
g. The dose equivalent of 12
ted to 26 years in the EFH 2011.
e assumed ED (i.e., residential child

Cancer Risk Mortality					Increased Lifetime Risk		
5.E-06					2/E-04		
5.E-06					5/E-05		
2/E-05					5.E-04		
2/E-05					3/E-04		
3/E-06					4/E-05		
3/E-05					9.E-04		
1.E-05					4/E-04		
5.E-06					2/E-04		
3.E-05					1.E-03		
6/E-07					8.E-06		
Stockade-Fenced Area	Formerly Fenced Old Depot Area "Source 1"	Soil strip parallel to Hedgerow and concrete apron "Source 2"	"Source 3"	Combined Hot Spots	Stockade-Fenced Area	Formerly Fenced Old Depot Area "Source 1"	Soil strip parallel to Hedgerow and concrete apron "Source 2"
1.E-05	5/E-05	3/E-05	9/E-06	4/E-05	4.E-04	2/E-03	1/E-05

d Lifetime Risk		
2/E-04		
5/E-05		
5.E-04		
3/E-04		
4/E-05		
9.E-04		
4/E-04		
2/E-04		
1.E-03		
8.E-06		
	"Source 3"	Combined Hot Spots
	3.E-04	1.E-03

1.E+01

4.E+00

1.E+01

9/E+00

7.E+00

2/E+01

2/E+01

2/E+01

2/E+01

7.E+00

Receptor	Annual Dose (mrem/year)
resident adult	9
resident child	9